PM2.5 National Ambient Air Quality Standard Health Exceedances on February 3, 2019

Exceedance Locations and Levels

On Sunday, February 3, 2019, there was one exceedance in New Jersey of the National Ambient Air Quality Standard (NAAQS) for PM2.5 (24-hour average of 35 micrograms/cubic meter, $\mu g/m^3$). See Table 1.

Table 1. New Jersey PM2.5 Concentrations on February 3, 2019

STATION	24-Hour Average ($\mu g/m^3$)
Brigantine	18.9
Camden Spruce St	33.0
Columbia WMA	36.5
Elizabeth Lab	27.0
Flemington	26.5
Fort Lee Near Road	28.8
Jersey City Firehouse	30.8
Millville	18.6
Newark Firehouse	28.8
Rahway	No Data
Rider University	26.4
Rutgers University	24.3
TOTAL EXCEEDANCES	1

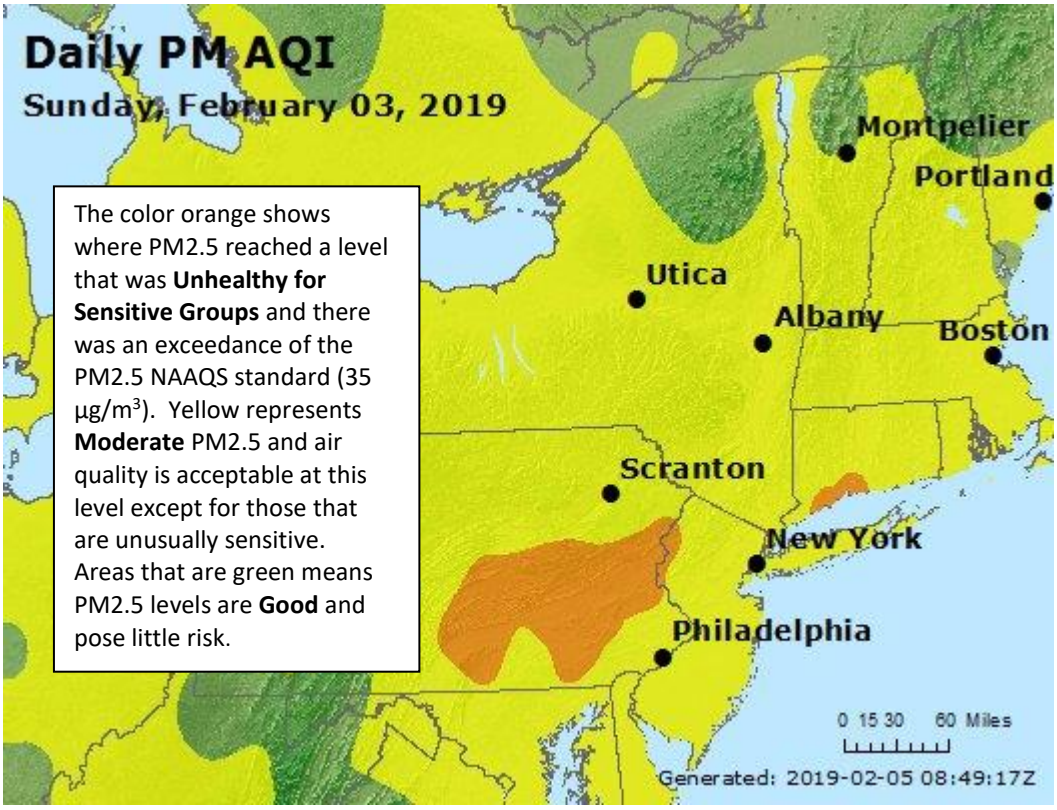
From the out-of-state stations adjacent to New Jersey, there were four (4) exceedances of the PM2.5 NAAQS. See Table 2.

Table 2. PM2.5 Concentrations at Out-of-State Monitoring Stations Adjacent to New Jersey on February 3, 2019

STATE	STATION	24-Hour Average ($\mu g/m^3$)
CT	Bridgeport	37.6
CT	Danbury	12.5
CT	New Haven - Criscuolo Park	36.2
CT	Waterbury	33.2
DE	KILLENS (Kent Co.)	25.9
DE	LUMS 2 (New Castle Co.)	18.8
DE	MLK (New Castle Co.)	30.5
DE	Rte 9 Del City	21.3
DE	SEAFORD (Sussex Co.)	29.3

MD	Fair Hill	20.2
NY	Bklyn - PS274	16.7
NY	CCNY	17.9
NY	Division Street	18.2
NY	Eisenhower Park	18.8
NY	Fresh Kills	15.9
NY	Holtsville	21.2
NY	Manhattan/IS143	19.2
NY	Maspeth	17.4
NY	Queens Near-road	19.4
NY	Queens	27.2
NY	White Plains	17.7
PA	Allentown	42.7
PA	Chester	35.1
PA	Freemansburg	39.4
PA	Marcus Hook	24.8
PA	New Garden	32.2
PA	Norristown	30.8
PA	FAB	30.0
PA	MON	28.3
PA	NEW	26.6
PA	RIT	27.7
PA	TOR	25.7
	TOTAL EXCEEDANCES	4

Figure 1. PM2.5 Air Quality Index for February 3, 2019



Source: www.airnow.gov

For PM2.5 terminology definitions see NJDEP Air Quality Planning's Glossary and Acronyms webpage: http://nj.gov/dep/baqp/glossary.html

Weather

A surface inversion on Sunday, February 3rd allowed for fine particulate concentrations to quickly increase throughout the region as there was limited mixing in the atmosphere. Given low mixing heights for a second day in a row, emissions from cars, trucks, and industry, as well as wintertime sources such as wood-, coal-, and oil-burning heating devices, were able to accumulate close to the surface, leading to multiple NAAQS exceedances in portions of the Mid-Atlantic and southern New England.

A large high pressure system was settled over the Mid-Atlantic region for a second day and was the dominant weather feature for New Jersey and adjacent states on February 3rd. Favorable weather conditions for elevated PM2.5 levels were observed including a second day of light winds throughout the region. In addition, a strong surface inversion was also observed on this day. A surface inversion can be defined as a reversal of normal temperature behavior in the troposphere. Instead of temperatures decreasing with height, temperatures increase with height and limit mixing in the atmosphere. These

conditions allowed for emissions to accumulate near the surface, leading to an increase in PM2.5 levels throughout the region and, in turn, multiple NAAQS exceedances.

Where Did the Air Pollution that Caused an Exceedance in PM2.5 Come From?

As high PM2.5 events are typically associated with a very stable atmosphere and low mixing heights, understanding weather dynamics at the surface is important. Figure 2 below shows surface level back trajectories for the monitored exceedances on February 3, 2019. This figure illustrates where surface winds came from during the 48 hours preceding the high PM2.5 event. Five (5) monitoring stations in the region with 24-hr PM2.5 NAAQS exceedances were used to run back trajectories. The selected sites and the 24-hr average PM2.5 level recorded are listed in Table 3 below:

Table 3. Monitoring Stations in New Jersey and Adjacent States with a 24-hr PM2.5 NAAQS Exceedance that were Selected to Run 48-hr Back Trajectories

STATE	STATION	24-Hour Average ($\mu g/m^3$)
CT	Bridgeport	37.6
CT	New Haven- Criscuolo Park	36.2
NJ	Columbia WMA	36.5
PA	Allentown	42.7
PA	Freemansburg	39.4

Backward trajectories from Sunday, February 3rd show localized transport at the surface from the industrialized areas of Pennsylvania where Unhealthy for Sensitive Groups and Unhealthy PM2.5 levels were recorded on the day preceding this high PM2.5 event.

Low level back trajectories (Figure 2) followed similar transport pathways, originating in portions of Pennsylvania and western Maryland. At the surface, air traveled southeastward briefly before making a sharp turn northeastward and passing through heavily industrialized portions of southeastern Pennsylvania. This portion of Pennsylvania includes the cities of Lancaster and Harrisburg where Unhealthy for Sensitive Groups and Unhealthy air quality was recorded in the days preceding the high PM2.5 event. At this time, air traveling at ground level likely picked up emissions from cars, trucks, and industrial facilities. In addition to these sources, air traveling along the ground may have also picked up emissions from wood-, coal-, and oil-burning heating devices which are all common sources of wintertime PM2.5. Upon traveling through Pennsylvania, trajectories traveling to New Jersey arrived at their destination in northwestern New Jersey. Trajectories traveling to Connecticut continued to travel through New Jersey and the New York City metropolitan area before reaching their destinations. All trajectories at the surface traveled a very short distance over the 48hours allowing particle levels to accumulate easily throughout their path.

Figure 3 shows regional PM2.5 concentrations observed on February 2, 2019, the day prior to this high PM2.5 event. As shown in the figure, widespread moderate, isolated USG, and Unhealthy air quality were observed throughout the entire region. In addition, the trajectories suggest that transport from southeastern Pennsylvania in combination with favorable weather conditions mentioned above enhanced levels of PM2.5 leading to a widespread regional event.

Figure 2. 48-hour Back Trajectories for February 3, 2019 at 10 meters

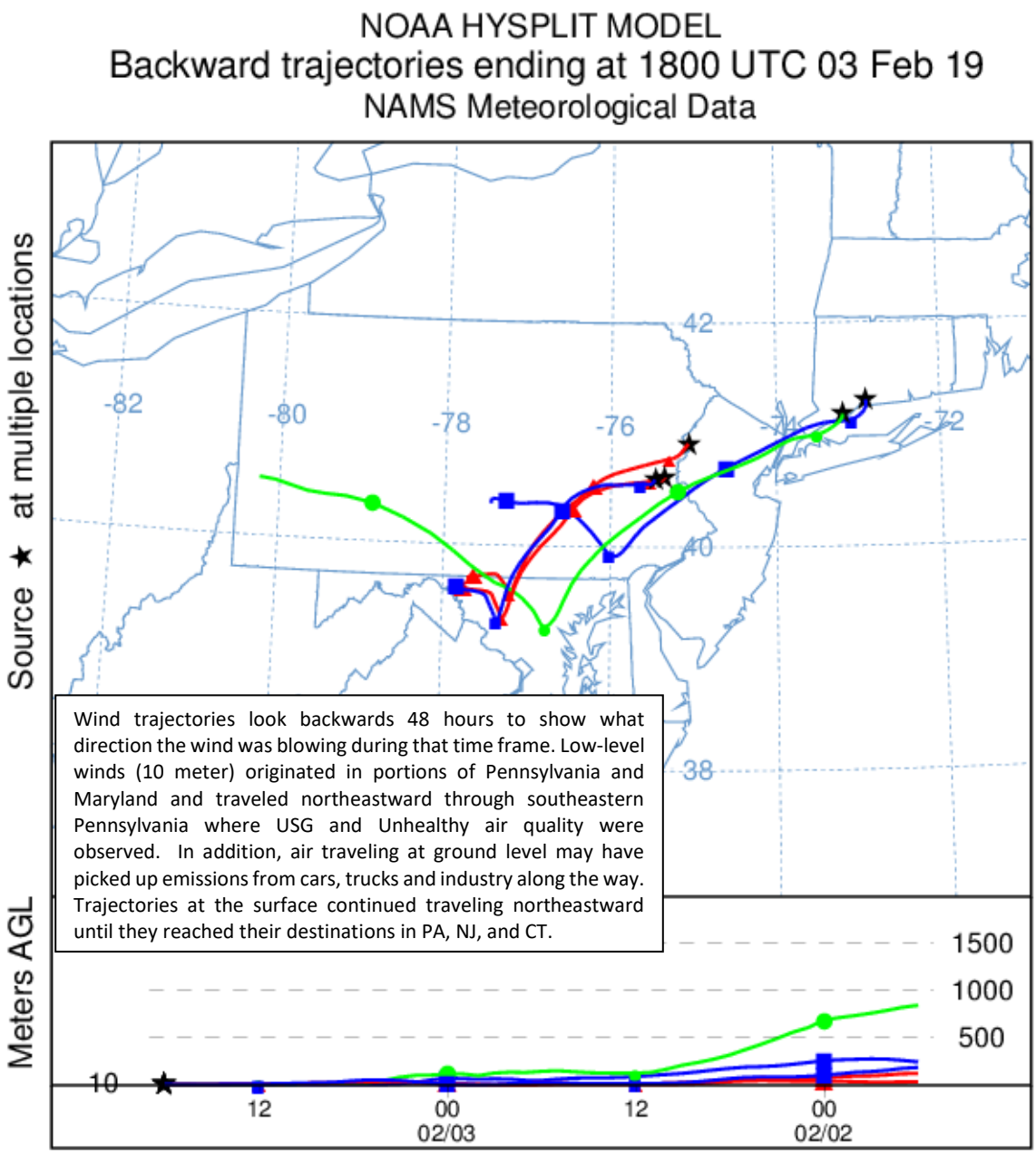
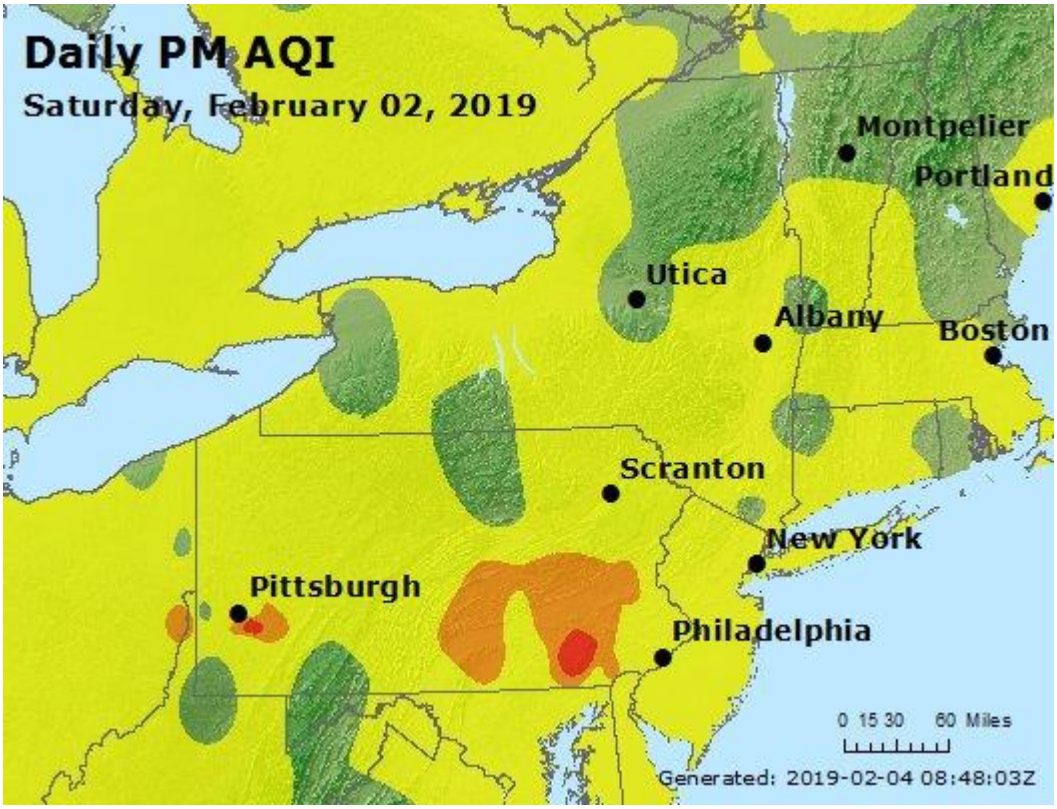


Figure 3. Regional PM2.5 Air Quality Index for February 2, 2019



Find Out About Air Quality Every Day

The "What's Your Air Quality Today?" page at http://www.nj.gov/dep/cleanairnj/ tells you how to sign up to receive notifications and find out when your local air has reached unhealthy ozone levels.